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ABSTRACT

Relationships between educators' innovation-adoption behavior and five attributes of innovation (relative advantage, compatibility, complexity, trial bility, observability) were examined. The attributes, developed by Rogers and Shoemaker, emerged from research in disciplines such as sociology and anthropology, and the present investigation was undertaken to determine their relevance to educator adoption of innovation. Data on 100 innovative educators collected in tape-recorded form by Wolf and Fiorino were analyzed to determine the effect of each of the attributes on subsequent innovation adoption/rejection. Results of the interpretation support only one hypothesis, that the complexity of an innovation is inversely related to its adoption. Four hypotheses (that relative advantage, compatibility, trialability, and observability would be positively related to adoption) were rejected. It was postulated that these results were due to: (1) the inapplicability of the attributes to the field of education; or (2) a lack of focus in the Wolf-Fiorino data which would permit a valid study of the hypothesized relationship. (MJB)

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RELATIONSHIPS BETWEEN PERCEIVED ATTRIBUTES OF INNOVATIONS AND THEIR SUBSEQUENT ADOPTION

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Objectives and Theoretical Framework

Relationships between educators' innovation adoption behavior and five attributes of innovations described by Rogers and Shoemaker[1] were highlighted in this study. Data initially obtained by Wolf and Fiorino[2] made possible the acquisition of quantifiable information about adoption behavior. Measures were devised to obtain quantifiable information from the Wolf and Fiorino data pool about Rogers and Shoemaker's attributes of innovation as well. Insight into relationships between characteristics of innovations and their subsequent adoption was the desired outcome of the investigation.

The attributes offered by Rogers and Shoemaker include: a. relative advantage; b. compatibility; c. complexity; d. trialability; and e. observability. Since these attributes emerged from research completed prior to 1970 in disciplines like sociology and anthropology for the most part, this investigation aspired to update the research base and then ascertain the relevance of research on attributes of innovation to the practice of randomly selected educators.

Study operationalization was especially difficult. The related research tended to obfuscate, to contradict, and to ignore. For example, the following generalizations were gleaned from recently published research:

1. Few studies focused upon the attributes of innovations. Those that have been carried out suggested attributes described by Rogers and Shoemaker are appropriate for education.

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[1] E. M. Rogers and F. F. Shoemaker, Communication of Innovations, New York: The Free Press, 1971. 476 pp.

[2] W. C. Wolf Jr. and A. John Fiorino, A Study of Educational Knowledge Diffusion and Utilization, Dayton, Ohio: C. F. Kettering Foundation, 1972. ED 061 772.

2. When researchers reported information about attributes of educational products, their accounts were compatible with Rogers and Shoemaker's conclusions.

3. Related studies focused upon either characteristics of adopters or diffusion strategies and tactics much more frequently than attributes of innovations.

4. The relationship of seemingly important variables like monetary considerations and user involvement to innovation adoption was unclear.

5. Information pertaining to attributes of innovations, drawn from disciplines like sociology and anthropology, may not meaningfully generalize to disciplines like education. Decision-making modus operandi of farmers and physicians may or may not relate to processes adhered to by educators.

← Not enough new information has been added to the literature since 1970 to alter Rogers and Shoemaker's set of attributes of innovations. For this reason, study procedures were based upon their set of attributes.

The direction of relationships between attributes of innovation and innovation adoption/rejection, as indicated by research summarized in Rogers and Shoemaker's most recent book, are indicated as follows:

1. The relative advantage of a new idea, as perceived by members of a social system, is positively related to adoption.

2. The compatibility of a new idea, as perceived by members of a social system, is positively related to adoption.

3. The complexity of an innovation, as perceived by members of a social system, is inversely related to adoption.

4. The trialability of an innovation, as perceived by members of a social system, is positively related to adoption.

5. The observability of an innovation, as perceived by members of a social system, is positively related to adoption.

Each of these hypotheses was tested using data drawn from educational settings. Tests conducted focused upon the stability of these five directional relationships within an educational context.

Data Sources

Data originally obtained by Wolf and Fiorino were used to test the five hypotheses set forth. The Wolf-Fiorino team of researchers conducted face-to-face interviews with hundreds of randomly-selected educators in order to obtain demographic data upon which this study is based. From 495 usable sets of data accumulated, the 100 most innovative educators were selected for analysis. Wolf and Fiorino devised a weighting scheme to rank order all subjects interviewed in terms of their innovation adoption record; hence, selection of the 100 subjects for study were easily done.

The determination of whether subjects adopted, were about to adopt, or attempted--but failed--to adopt innovations, was based upon their responses to certain questions raised by the interviewers. All interviews were conducted face-to-face in the setting of the subjects' practice.

These tape recorded interviews were used to select the 100 most innovative subjects for further study and to rate each of the five attributes of the adopted innovations. Ratings of each of the attributes were compiled, totaled for each subject and across subjects, and used to determine the relative impact of the attributes upon adoption.

Methods and Techniques

An ex post facto study design was utilized. The adoption of innovations, reported by randomly sampled educators, constitutes the dependent variable of the study. Independent variables isolated for study include the relative advantage of, the compatibility of, the complexity of, the trialability of, and the observability of, the innovations which were adopted in varying degrees. Conceptually, the design looks like the following:

R X Y

R represents a random sample of the population, X represents the independent variables, and Y represents the dependent variables.

Two instruments were employed: first, an interview inventory originally designed for the Wolf and Fiorino study; and second, a worksheet especially designed to quantify attributes of adopted innovations. The interview inventory was first used about ten years ago and evolved through three pilot trials and two major revisions. The final version aspired to determine: 1) what ideas and practices were new to the interviewees; 2) what antecedents and causal events were influential in the mind of the interviewee upon adoption of new products, ideas, and practices; and 3) descriptive data about the interviewee, and about influential diffusion agents. Each interview was recorded on tape after permission from the subjects were obtained. The interview was preceded by a brief warm-up session and was usually followed by some conversation. Only the interview itself was recorded. Following each interview, information on the tape was first transferred to a survey instrument worksheet and then later onto a codification sheet which served as the basis of a computer analysis of the data.

The Worksheet for Weighting Attributes of the Adopted Innovations was devised by the researchers to determine the degree to which the attributes of an adopted innovation were observed. Data tabulated on the worksheet permitted an appraisal of the relative advantage, complexity, compatibility, trialability, and observability of the adopted innovations. These attributes were further divided into sub-attributes to yield a more comprehensive picture of each. Each attribute was operationalized on the basis of information provided by Rogers and Shoemaker and by Wolf.

A chi square test was used to determine the significance of each stated hypothesis. The chi square tests revealed which of the attributes and sub-attributes impacted significantly upon innovation adoption. Further analyses, using descriptive statistics, were conducted to yield information about the direction--positive or negative--of relationships and the nature of relationships.

TABLE 1

The Operationalized Attributes Studied

Attributes	Weight	Score
A. Relative Advantage		
1. Money Saved		
a. funds saved or		
b. more service for same investment	1	
2. Time Saved	1	
3. Expenditure of Energy Reduced	1	
4. Popularity is Increased	.5	
Total	3.5	
B. Compatibility		
1. Established Staff Utilization Practices	1	
2. Established Curriculum	1	
3. Established Methods of Instruction	1	
4. Existing School Purposes	1	
Total	4	
C. Complexity		
1. Materials and Equipment Needed		
a. none or moderate	.5	
b. extensive	1	
2. Training Requirements		
a. none or handled by persons within system	1	
3. Staff Additions Required	1	
4. Modifications to Facility		
a. none or moderate	.5	
b. extensive (new facility required)	1	
Total	5.5	

TABLE 1 --Continued

Attributes	Weight	Score
D. Trialability		
1. Formal Trial		
a. internally expedited	1	
b. externally expedited	2	
2. Informal Trial		
a. internally expedited	.5	
b. externally expedited	1	
3. Evidence of Trial Present	1	
Total	5.5	
E. Observability		
1. Presence of Physical Object	2	
2. Presence through Utilization (i.e., individualized progress)	1	
3. Presence through discussions and examinations of policy documents	.5	
Total	3.5	

Results and Conclusions

Results of the hypotheses tests and conclusions drawn from the analyses are reported in the following paragraphs.

Hypothesis One. The relative advantage of a new idea, as perceived by members of a social system, is positively related to its adoption.

Given a possible range of response from -3.5 to +3.5 for this attribute, the mean score obtained was -.24, or nearly zero. Negative scores outnumbered positive scores in what approximated a multi-modal distribution.

Chi square analyses of the composite data were not significant at the .05 level chosen. Further analyses of the sub-attribute scores revealed two of the four were significant. "Money Saved" and "Popularity Increased" proved to be significantly related to adoption, the former negatively related and the latter positively related.

The opposite results for these two sub-attributes account for the overall mean score being near zero, and preclude a general conclusion about relative advantage as a factor related to innovation adoption. It seems logical to view sub-attributes of this factor separately. Even though the composite data obtained do not support the relationship hypothesized, the two significant sub-score relationships and the multi-modal distribution raise questions worth further study. Nevertheless, adherence to procedures set forth for testing hypothesis one indicate the hypothesized relationship cannot be accepted.

Hypothesis Two. The compatibility of a new idea, as perceived by members of a social system, is positively related to adoption.

Given a possible range of response from -4.0 to +4.0 for this attribute, the mean score obtained was +.30, or nearly zero. Positive scores outnumbered

negative scores in what approximated a normal distribution.

Chi square analyses of the composite data were not significant at the .05 level. Further analysis of the sub-attribute scores revealed two of the four to be significant. "Compatibility with the Established Method of Instruction" and "Compatibility with Existing School Purposes" proved to be significantly related to adoption, the former negatively related to adoption and the latter positively related.

Again, the divergent results of these two sub-attributes account for the overall mean score being near zero, and preclude a general conclusion about compatibility as a factor related to innovation adoption. It seems logical to view sub-attributes of this factor separately. Hence, adherence to procedures set forth for testing hypothesis two indicate the hypothesized relationship cannot be accepted.

Hypothesis Three. The complexity of an innovation, as perceived by members of a social system, is inversely related to its adoption.

Given a possible range of responses from -5.5 to +5.5 for this attribute, the mean score obtained was -3.61. Negative scores far outnumbered positive scores in what approximated a positively skewed distribution.

Chi square analysis of the composite data were inversely significant at the .05 level. Further analysis of the sub-attribute scores revealed only two of the seven sub-attributes not to be significant. Results suggest the less complex an innovation, the more likely it is to be adopted. Hence, results of these analyses tend to support the hypothesized relationship.

Hypothesis Four. The trialability of an innovation, as perceived by members of a social system, is positively related to its adoption.

Given a possible range of response from -5.5 to +5.5 for this attribute, the mean score obtained was -3.60. Negative scores far outnumbered positive

scores in what approximated a positively skewed distribution.

Chi square analyses of the composite data were inversely significant at the .05 level. Further analysis of the sub-attribute scores revealed one of the five positively significant. This sub-attribute was "An Informal Trial Conducted Internally." The remainder of the sub-attributes were negatively related to adoption.

Even though significant results were obtained, the results were opposite the direction hypothesized. Adherence to procedures set forth for testing hypothesis four indicate the hypothesized relationship cannot be accepted.

Hypothesis Five. The observability of an innovation, as perceived by members of a social system, is positively related to its adoption.

Given a possible range of response from -3.5 to +3.5 for this attribute, the mean score obtained was +1.30. Nevertheless, negative scores outnumbered the positive in what approximated a bimodal distribution.

Chi square analysis of the composite data were not significant at the .05 level. Further analysis of the sub-attribute scores revealed two of the three were significant. "Presence Through Utilization" and "Presence Through Discussion" proved to be positively related to adoption.

This most perplexing distribution of data thwarted meaningful generalizations about observability. The two significant sub-scores and the bimodal distribution certainly raise questions worth further study. Meanwhile, adherence to procedures set forth for testing hypothesis five indicate the hypothesized relation cannot be accepted.

To recapitulate, only one of the five hypothesized relationships could be accepted. The fact that four of five directional relationships did not generalize from related disciplines to the discipline of education was unexpected.

TABLE 2

RELATIONSHIP BETWEEN OPERATIONALIZED ATTRIBUTES AND ADOPTION

Attributes of Innovation	Significant*	Relation to Adoption
A. Relative Advantage	No	None
1. Money Saved	Yes	Negative
2. Time Saved	No	None
3. Expenditure of Energy Reduced	No	None
4. Popularity Increased	Yes	Positive
B. Compatibility	No	None
1. Established Staff Utilization Practices	No	None
2. Established Curriculum	No	None
3. Established Methods of Instruction	Yes	Negative
4. Existing School Purposes	Yes	Positive
C. Complexity	Yes	Negative
1. Material and Equipment Needed		
a. none or moderate	No	None
b. extensive	Yes	Negative
2. Training Requirements		
a. none or handled by persons within the system	No	None
b. handled by persons external to the system	Yes	Negative
3. Staff Additions Required	Yes	Negative
4. Modifications to the Facility		
a. none or moderate	Yes	Negative
b. extensive (new facility required)	Yes	Negative

TABLE 2 --Continued

Attributes of Innovations	Significant*	Relation to Adoption
D. Trialability	Yes	Negative
1. Formal Trial		
a. internally expedited	Yes	Negative
b. externally expedited	Yes	Negative
2. Informal Trial		
a. internally expedited	Yes	Positive
b. externally expedited	Yes	Negative
3. Evidence of Trial Present	Yes	Negative
E. Observability	No	None
1. Presence of a Physical Object	No	None
2. Presence through Utilization	Yes	Positive
3. Presence through Discussions and Examination of Policy Documents	Yes	Positive

*Significant at .05.

Rogers and Shoemaker's designated attributes of innovations represents one of about a half dozen lists which appeared in the literature in recent years. Each of these lists is based upon research completed for the most part in disciplines other than education. These attributes are supposed to relate to the subsequent adoption or rejection of innovations. Results of this investigation, based entirely upon data drawn from educational settings, suggested innovation attributes selected for study provided little insight into adoption of educational innovations.

Since the anticipated confirmation of generalizations about characteristics of innovations which related to subsequent adoption of innovations failed to materialize, the researchers weighed alternative explanations for the outcome. Two explanations seemed tenable. First, generalizations based upon studies of individual entrepreneurs' behavior (i.e., farmers and physicians) may not be as applicable to the behavior of entrepreneurs functioning within collective decision-making systems (i.e., education) as was once believed. And second, data originally obtained by the Wolf-Fiorino interviewers may not be focused sharply enough to permit a valid study of the hypothesized relationships. Further research is clearly called for in order to understand these relationships.

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